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Utilization of Coffee Skin Waste as Compost Fertilizer in Tapak Gedung Village, Kepahiang

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Abstract

Tapak Gedung is a village where most residents work as coffee farmers. This means that this village has a lot of coffee skin waste. This coffee skin waste is just left to lie around without being processed into something useful. Therefore, Thematic KKN students developed compost fertilizer from coffee skin waste in Tapak Gedung village which aims to optimize the natural potential in the form of abundant but unutilized coffee skins. This product has utility value for village communities, especially farmers, the majority of whom live in the village. Using coffee skin waste as a basic material in the composting process is an efficient solution to reduce the amount of coffee skin waste in the village. The decomposition process is accelerated by the addition of EM4 bacteria, helping in the decomposition of manure thereby optimizing the composting process. Compost is made from 80 kg of coffee husk bran, 200 mL of EM4 diluted with 18 L of water, 20 kg of animal waste, and 1 kg of urea. Thematic KKN students conveyed information about composting coffee husk waste to the Tapak Gedung village community through outreach, discussions and PowerPoint slide presentations. As a result, the compost that has been produced is distributed to village communities and applied to crops and agricultural land.

A. Introduction

Tapak Gedung is a village in Kepahiang Regency, Bengkulu Province. This village is located in Tebat Karai subdistrict, which was previously part of Kepahiang subdistrict before experiencing expansion. The area of Tapak Gedung village reaches approximately ± 500 Ha. This village is inhabited by the Serawai tribe, with the majority of the population earning their livelihood as farmers (90%), while the other 10% work as employees or traders. The main agriculture in this village is coffee, with Arabica and Robusta varieties being the types of coffee most widely planted by the community. Apart from coffee, the community also grows vegetables such as lettuce, eggplant and chilies as an additional source of income. This village has a unique traditional culture known as Sekujang. One of the most visited tourist attractions in Tapak Gedung is the waterfall, especially the Curug Embun waterfall, the Wak Judek waterfall is one of the leading tourism destinations in this village (Handayani et al., 2022).

Coffee seedlings require fertilizer to support their development and growth. There are two types of fertilizer that can be given to seeds, namely organic fertilizer and inorganic fertilizer.One type of organic fertilizer that can be used on coffee seedlings is compost (Luthfi et al., 2023; Rosniawaty et al., 2020; Yulianti et al., 2022). Compost fertilizer comes from the decomposition or decomposition of organic materials such as leaves, straw, reeds, kitchen waste, livestock manure, city waste and agricultural industrial waste. Compost can be used as a source of plant nutrients because it contains adequate amounts of macro and micro nutrients. Even though the nutrient levels in compost are low, high doses are required to achieve optimal

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results (Andrie et al., 2021; Indrawan et al., 2016; Murrinie et al., 2022). Providing coffee husk compost has a significant impact on various plant growth and yield variables. Coffee husk compost can improve the physical, chemical and biological properties of soil. The physical properties of the soil cause better root development so that plants can absorb nutrients. Providing organic matter can also affect the chemical properties of the soil, namely increasing the soil pH. In the process of processing coffee beans into coffee powder, waste is produced in the form of coffee skins. Coffee husks left over from grinding are usually just thrown away or as useless waste without processing. This is due to low public awareness of protecting the environment from coffee waste pollution, low public knowledge and skills to process coffee waste into compost. Using coffee husk compost blocks as a planting medium has several advantages, namely reducing the buildup of coffee husk waste, reducing the use of polybags so that it is more environmentally friendly, and being effective as a planting medium in small areas. With the existence of block compost, it is hoped that it can be an alternative solution in overcoming the problem of increasingly decreasing agricultural land (Novita et al., 2019).

Making fertilizer is one of the factors that supports the success of fertilization. The longer the composting process takes, the better the fertilizer will be produced for seedlings. The fertilizer produced is characterized by its black color, looseness, odorlessness, heatlessness, and weathering. The level of fineness of the resulting coffee skin is averaged to make processing easier. The soil used is first autoclaved to minimize the bacteria contained in the soil, so that later we will know exactly the effect of this organic coffee skin fertilizer on the growth of coffee seedlings. Some people deal with the accumulation of waste by simply burning it. In fact, this waste should be able to become something that has high value if it is used properly and appropriately. In simple terms, coffee skin waste can be used as natural fertilizer for the coffee plant itself. Coffee fruit skin waste contains organic material and nutrients that have the potential to be used as a planting medium (Falahudin et al., 2016).

The biological properties of the soil that are improved by adding coffee husk compost include increasing the energy supply needed by soil microorganisms, because compost generally contains organic acids as food for these microorganisms. This will ensure the presence of soil microorganisms so that they can accelerate the release of nutrients that have not been decomposed in the planting medium. The population of soil microorganisms increases with the addition of organic matter to the soil. The presence of nutrients that have been decomposed by soil microorganisms results in the availability of nutrients that are ready to be absorbed by plant roots. The absorption of these nutrients will influence the growth of coffee plant seeds to tend to be good while in nursery. Physical improvement of the soil by adding coffee husk compost makes the soil looser and better. Increasing organic matter and soil texture greatly influences the condition of other soil properties such as soil structure, soil permeability and porosity. This can make the planting medium have sufficient water reserves for plant growth so that it can increase nutrient and water uptake (Mitha et al., 2020).

Utilizing coffee skins as compost can provide many benefits for plant growth and development. The use of coffee skins as compost for plant cultivation is a source of organic material that determines plant growth and development as well as increasing soil fertility. This has been proven physically, biologically and chemically in the soil, which has a positive influence on the agricultural products cultivated. This allegedly occurs because the coffee grounds compost fertilizer has not yet matured or decomposed completely, so it will affect the growth of plants growing on the application media, because it has an influence on the condition of the soil or planting medium. Organic fertilizer should be applied in mature conditions. The microorganisms contained in immature compost are still actively breaking down the compost material so that when applied to plants, the microorganisms will take nutrients from the soil. This will cause plants to not grow optimally due to a lack of nutrients due to competition with microorganisms in the soil (Bonaventura & Kusumawati, 2022).

Based on the description above, this activity carried out the development of compost fertilizer from coffee skin waste in Tapak Gedung village which aims to optimize the natural potential in the form of coffee skins which are abundant but have not been utilized. Apart from that, information regarding composting of coffee husk waste was also conveyed to the Tapak Gedung village community through outreach, discussions and power point slide presentations.

B. Research Method

Thematic KKN activities with a work program for making compost fertilizer from coffee skin waste were carried out in Tapak Gedung village, Tebat Karai District over a period of 4 months, namely from August-December 2023 with the target activities being farmers and the community using the following methods:

1. Making organic compost from coffee skin waste with village farmers

In this method, a hole is made in the garden of one of the village farmers with a width of 1 meter × 2 meters with a depth of ±1.5 meters. After 5 days of making the hole, continue with collecting materials, namely 80 kg of dry and semi-wet coffee bran, making a solution of 200 mL of EM4 which is dissolved in 18L of water, animal waste and 1kg of Urea. The ingredients that have been provided are then added in layers, in the first layer, the coffee skin bran is added, followed by animal waste, then sprayed with EM4 solution, then sprinkled with urea on top until evenly distributed, this process is repeated until all the ingredients are used up. The addition of EM4 or Effective Microorganisms to the compost fermentation process, namely as bacteria or fungi which play an active role as bioactivators to help the process of breaking down organic compounds into simple compounds (Setyawati et al., 2021). The detailed steps for making compost and layering the compost material are as follows:

a. The coffee skin bran is put into the hole provided, then sprinkled with animal waste on top, then the EM4 solution or decomposer is sprayed to wet the surface. After that, urea is sprinkled as dolomite until evenly distributed.
b. All these materials are repeated until they are layered and almost fill the mold hole.
c. After that, a roof or cover is made to prevent excessive water from entering. A siding is made around the compost pit to prevent rainwater from causing landslides.
d. After 35 days the compost is ready to harvest. Compost is marked as successful and can be seen from the small roots that grow along the walls of the compost pit.
e. The compost is packaged and applied to several community plants, such as kates trees, chilies, tomatoes and eggplants.

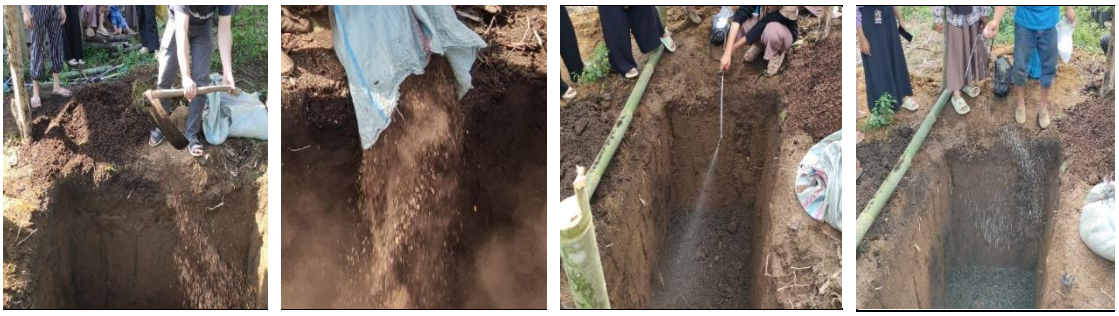

Figure 1. The process of making coffee skin waste compost

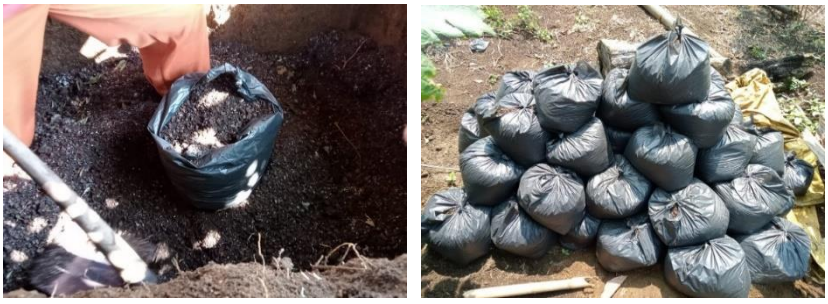

Figure 2. Compost packaging after 35 days fermentation

2. Dissemination of information in the form of socialization regarding composting from coffee skin waste as well as discussions with the public and questions and answers

Dissemination of information in the form of socialization aims to inform people of the results achieved who cannot participate in making compost. Explanation of composting to increase public understanding regarding the bioconversion of coffee husk bran into compost and its benefits. This activity was carried out with socialization in front of the Tapak Gedung village community as well as a question and answer session so as to give the community the opportunity to ask questions about this compost product. At the end of the event, compost that had been packaged in plastic was distributed to the village community.

C. Result and Discussion

Community service activities by S1-CHEMIA Thematic KKN students regarding the use of coffee husk waste as compost fertilizer in Tapak Gedung village have been carried out in several stages. The first stage is making composting media in the Kates garden belonging to one of the village residents. The hole digging media is selected according to the conditions in the field (Figure 3). According to Triawan et al (2020), another alternative composter media can be a building made of wood which aims to facilitate the process and control of the water and air conditions of the compost being made. However, in Tapak Gedung village which is located in the highlands, the soil produced is loose soil and has humid weather temperatures, so the choice of making a composter on the ground is the right choice.

Figure 3. Composter Making

Then make EM4 solution as a decomposer (Figure 4). Basically, composting is decomposition using microbial activity, therefore the speed of decomposition and quality of compost depends on the condition and type of microbes that are active during the composting process (Amalia & Widiyaningrum, 2016). As a result of discussions with one of the farmers in Tapak Gedung village, EM4 has often been used in village farmers' agriculture and plantations, and has obtained good results for plants, because it can increase and maintain production stability and can fertilize plants and make the soil healthy. So choose EM4 as a decomposer in compost fermentation as it decomposes and degrades complex organic materials into simple ones in the form of soil. According to Dahlianah (2015), the advantage of the EM4 solution is that apart from being able to speed up the composting process, the addition of EM4 is also proven to be able to eliminate odors that arise during the composting process if it goes well.

Figure 4. Making EM4 Solution (Decomposer)

After the composter media is made, the prepared materials are added gradually to form layers until the provided materials are used up. Then close the compost hole tightly using a tarpaulin and cover it with plastic until it is tightly closed and airtight (Figure 5). This aims to ensure that decomposition runs perfectly. Air can make the decomposition process not run properly.

Figure 5. Compost pit closure

The next stage is fermentation. At this stage, fermentation is carried out for 35 days from the day after closing the compost pit. This time is enough to produce good compost. Indicators of compost formation are characterized by blackened compost color, soft texture, easily crushed and brittle (Figure 6). The level of success that can indicate that the compost is well fermented is the emergence of roots on the walls of the compost pit (Figure 7).

Figure 6. Finished compost texture

Figure 7. The growth of roots on the walls of the compost pit

The final stage is the socialization and delivery of information to the public by the Thematic KKN student group with power point slides and an explanation regarding the use of coffee skin waste which can be processed into compost. At this stage, 45 people from Tapak Gedung village attended who were very

enthusiastic, so that during the discussion and question and answer session the participants really wanted to know about making compost fertilizer. Because the majority of farmers in this village are coffee farmers and the accumulation of coffee skin waste has increased the public's willingness to utilize coffee skin waste. At the end of the socialization event, the Thematic KKN student group distributed packaged compost fertilizer to the Tapak Gedung village community (Figure8).

Figure 8. Socialization and distribution of compost fertilizer to the Tapak Gedung village community

This activity has limited time, so The Thematic KKN student group as a facilitator was unable to further monitor the application of compost fertilizer from coffee skin waste carried out by the Tapak Gedung community. However, it is hoped that this activity can provide lessons to the Tapak Gedung community in utilizing coffee waste so that it has useful and economic value.

D. Conclusion

The activities that have been carried out can increase public knowledge regarding the use of coffee husk waste as compost which has useful and economic value. The method of conveying information to the public in the form of outreach was considered effective, judging by the enthusiasm of the community during the activity. The results of compost from coffee skins were also considered successful. The success index for producing good compost can be seen from the roots that grow along the soil walls of the compost pit.

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